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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,462	12/12/2003	Bruce W. Smith	88405.000231	9693

7590 08/05/2005

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EXAMINER

GUTIERREZ, KEVIN C

ART UNIT	PAPER NUMBER
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2851

DATE MAILED: 08/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

H.A

Office Action Summary	Application No.	Applicant(s)	
	10/734,462	SMITH, BRUCE W.	
	Examiner	Art Unit	
	Kevin Gutierrez	2851	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on December 12, 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) 23-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-22 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on December 12, 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>June 21, 2004</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-22 in the reply filed on July 11, 2005 is acknowledged.
2. Claims 23-39 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a species 1 - Figure 8a, there being no allowable generic or linking claim. Election was made without traverse in the reply filed on July 11, 2005.

Specification

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

4. The disclosure is objected to because of the following informalities: the quantity of words exceeds 150.

Appropriate correction is required.

Claim Objections

5. Claim 15 is objected to because of the following informalities:
- a. Page 22, line 28 - “...aberation” where the underlined text appears to have a spelling error.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 2, 6-10 and 13-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen (US 2003/0098970).

Regarding claim 1, Chen teaches

- “providing a test target with at least one open figure including a multiple component array of phase zones, wherein the multiple phase zones are arranged within the open figure so that their responses to lens aberrations are interrelated and the phase zones respond uniquely to specific aberrations depending on their location within the figure (see fig.5b, where #12 and #14 are sub-resolution features and [0058], lines 4-5);

- placing the test target in an object plane of a projection system ([0003], lines 1-2);
- imaging a photoresist film with the projection system ([0003], lines 2-4); and
- comparing the image in the photoresist film to a reference image without aberrations to detect aberrations in the optical system ([0019], lines 10-13, where predetermined patterns are printed on a substrate and then compared to the predetermined patterns of the mask)."

Regarding claim 2, Chen teaches "wherein the differences between the imaged photoresist and the reference image indicate the type and degree of aberration ([0063], lines 16-18)."

Regarding claim 6, Chen teaches "wherein the phase zones are 180 degrees out of phase with respect to the rest of the target ([0060], lines 3-4)."

Regarding claim 7, Chen teaches "wherein the phase zones are etched into the surface of the target (Fig. 6, #10 and [0064], lines 4-7, where the OHR (octad halftone monitor) is formed in the mask)."

Regarding claim 8, Chen teaches "wherein the phase zones comprise at least two zones with one phase zone larger than the other phase zone ([fig. 5b, where #14 is larger than neighboring #12)."

Regarding claim 9, Chen teaches "wherein the phase zones comprise at least two zones of substantially the same size (fig. 3c, where #12's are identical in size)."

Regarding claim 10, Chen teaches "wherein the phase zones comprise a central phase zone and plurality of circumferential phase zones wherein the central phase

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zone is larger than the circumferential phase zones (fig. 5b, where #14 is larger than neighboring #12's)."

Regarding claim 13, Chen teaches "wherein each phase zone is circular, rectangular, elliptical, or hexagonal ([0055], lines 2-5)."

Regarding claim 14, Chen teaches "wherein the target comprises a central phase zone and eight circumferential phase zones [0057], lines 9-10 and fig. 5b where there are eight #12s) equally angularly spaced from each other for detecting astigmatism, coma, spherical aberration and three point aberration (see fig. 3c, where #12s are equally angularly spaced and [0058], lines 3-5)."

Regarding claim 15, Chen teaches "wherein the test target has at least two circumferential phase zones spaced 180 degrees apart from each other for detecting positive or negative lens aberration (fig.3a, where #12a and #12b are elements across from one another and [0058], lines 3-5)."

Regarding claim 16, Chen teaches "wherein the test target has at least two more circumferential phase zones spaced 180 apart from each other and 90 degrees from the first two circumferential phase zones for detecting positive and negative lens aberration (fig.3a, #12a - #12d, where #12a-b and #12c-d are right angles to each pair and each pair constituent is 180 degrees from the other and [0058], lines 3-5)."

Regarding claim 17, Chen teaches "wherein the test target has at least four circumferential phase zones located at 0, 90, 180, 270 degrees and two more phase zones at 135 and 315 degrees or 45 and 225 degrees to detect 45 degree astigmatism

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(fig.3a, #12s and #12a - #12d, where the elements are arranged at increments of 45 degrees from 0 to 360 degrees and [0058], lines 3-5)."

Regarding claim 18 and 20, Chen teaches "wherein the test target has phase zones with similar or different shapes (fig. 3a, where each element of #12 has a quadrilateral shape)."

Regarding claim 19, Chen teaches "wherein the test target has phase zones with circular, rectangular, elliptical, pentagonal, triangular or hexagonal shapes ([0055], lines 2-5)."

Regarding claim 21, Chen teaches "wherein the test target has a central phase zone with one shape and circumferential phase zones with a different shape (fig. 5b, where #12 are and #14 are of different shapes)."

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Omura (US 2003/0147061).

Regarding claim 3, Chen teaches all of the claimed limitations except the use of microelectric equipment.

However, having “wherein the optical system comprises microelectronic photolithographic equipment for exposing a semiconductor wafer to a photomask carrying a pattern for a microelectronic device” is routine in the art as taught by Omura ([0301], line 2, where the apparatus uses a fly-eye lens). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a matter described above for at least the purpose to produce a more accurate image.

10. Claims 4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Lee (US 2003/0203319).

Regarding claims 4 and 5, Chen teaches “where λ is the wavelength of the light exposing the target and NA is the numerical aperture of the exposure system ([0007], line 10),” but does not teach “wherein size of the phase zones and the spaces between the phase zones are between $0.5\lambda NA$ to $1.5\lambda NA$ ” nor “wherein the size of the target is between $2.0\lambda NA$ to $6.0\lambda NA$ where λ is the wavelength of the light exposing the target and NA is the numerical aperture of the exposure system.”

However, having (claim 4) “wherein size of the phase zones and the spaces between the phase zones are between $0.5\lambda NA$ to $1.5\lambda NA$ ” and (claim 5) “wherein the size of the target is between $2.0\lambda NA$ to $6.0\lambda NA$ where λ is the wavelength of the light exposing the target and NA is the numerical aperture of the exposure system” are

routine in the art as taught by Lee ([0006], lines 5-6 and fig. 3a, where the spaces between patterns are allowed to be greater or less than the value of λ).” Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a matter described above for at least the purpose to detect various of other aberrations.

11. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Fukuhara et al (6,839,132).

Regarding claim 11, Chen teaches all of the claimed limitations except a central phase zone being substantially the same size as a circumferential phase zone.”

However, having “wherein the central phase zone is substantially the same size as the circumferential phase zones” is routine in the art as taught by Fukuhara et al (fig. 15, #150, where the two central vertical patterns are substantially the same size). Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a matter described above for at least the purpose to detect more aberrations.

Regarding claim 12, Chen teaches all of the claimed limitations except for a central phase zone being smaller than a circumferential phase zone.

However, having “wherein the central phase zone is smaller than the circumferential phase zones” is routine in the art as taught by Fukuhara et al (fig. 15, #150, where the are various sizes of vertical patters presented).” Thus, it would have

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been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a matter described above for at least the purpose to detect more aberrations.

12. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Wristers et al (6,552,776).

Regarding claim 22, Chen teaches

- “arranging a test object in the object plane of the system,
- providing a photoresist layer in the image plane of the system ([0003], lines 1-2),
- imaging the test object by means of the system and an imaging beam ([0003], lines 2-4);
- developing the photoresist layer ([0003], lines 7-8), and
- detecting the developed image by means of a scanning detection device ([0063], lines 14-15),
- characterized in that use is made of a test object which comprises at least one open figure having a phase structure, wherein the image of this figure is compared to a reference image of known or no aberration in order to determine the type and amount of aberration in the optical imaging system ([0019], lines 10-13, where predetermined patterns are printed on a substrate and then compared to the predetermined patterns of the mask).”

Chen does not teach a “scanning detection device having a resolution which is

considerably larger than that of the imaging system.”

However, having “scanning detection device having a resolution which is considerably larger than that of the imaging system” is routine in the art as taught by Wristers et al (col. 7, 1-3, where the SEM uses a high resolution).” Thus, it would have been obvious to one ordinary skilled in the art at the time the invention was made to modify Chen in a matter described above for at least the purpose to perform more accurate measurements.

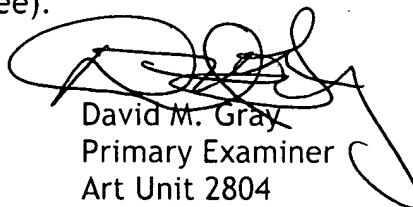
Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Shiode (US 2003/0091913) discloses a method of measuring aberrations of a projection optical system and Hayata (5,367,4040) discloses a rectangular stop in an image projection apparatus.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin Gutierrez whose telephone number is (571)-272-5922. The examiner can normally be reached on Monday-Friday: 7:30 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Nguyen can be reached on (571)-272-2258. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



David M. Gray
Primary Examiner
Art Unit 2804

July 25, 2005